

**REMARKS/ARGUMENTS**

Reconsideration of the present application, as amended, is respectfully requested.

**A. STATUS OF THE CLAIMS**

As a result of the present amendment, claims 1-6 and 8-13 are presented in the case for continued prosecution.

Claim 1 has been amended to recite that the flowable mass comprises a curable and nanomeric material. Support for this amendment can be found, for example, at page 4, line 5 of the application. In addition, claim 1 has been amended to include the subject matter of claim 7, namely, to recite that curing is realized with UV light. Claim 7 has accordingly been cancelled.

Claim 2 has been amended to delete the language reciting that the optical scan technique is preferably a laser technique. This subject matter has been newly presented as dependent claim 13.

Claim 4 has been amended to further detail the measures taken to adhere the layers and remove excess material. Specifically, claim 4 recites that the layers are successively applied onto each other with selective curing. Support for this amendment can be found, for example, at page 3, line 29 to page 4, line 4 of the application.

**B. THE INVENTION**

The present invention, as defined by the amended claims, includes a method for fabricating a functional dental element using a three-dimensional printing technique. Successive layers of a flowable mass are applied onto each other using an inkjet method and are bonded with UV light. A dental element prepared by this method is also claimed.

One of the advantages of the claimed invention is that functional dental elements can be tailor-made in a flexible and efficient manner while satisfying shape, mechanical and color properties. Thus, dental elements displaying an improved slow crack gradient and improved color stability can be manufactured. Furthermore, the cumbersome use of expensive molds is no longer necessary (page 2, lines 23-27).

C. REJECTIONS UNDER 35 U.S.C. § 112

Claims 2-10 had been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner has stated that claim 2 improperly recites both a broad range and a narrow range, while the language "wherein measures are taken" renders claim 4 unclear. Claims 3 and 5-10 have been included in the rejection since they are ultimately dependent upon claims 2 and 4.

As discussed in section A above, Applicant has presented the narrow range of claim 2 in new dependent claim 13. Claim 4 has been amended to further define the measures taken to adhere each layer and remove the non-adhering material.

It is respectfully submitted that claims 2 and 4 meet the requirements of 35 U.S.C. § 112, second paragraph.

D. REJECTIONS UNDER 35 U.S.C. § 103(a)

The Examiner has rejected the subject matter of claims 1-7, 11 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Brodtkin (US 6,322,728) in view of Danforth (US 5,900,207). Brodtkin has been cited to teach a process for making a dental element using a 3-D printing technique wherein a layer of ceramic powder is cured to form the element. Danforth has been cited to teach the use of a nanomeric material in a 3-D CAD freeform process. The Examiner has taken the position that it would be obvious to employ the nanomeric material of Danforth in the 3-D technique of Brodtkin.

In order to maintain a *prima facie* obviousness rejection under 35 U.S.C. § 103(a), a prior art reference or a combination of references must render the claimed subject matter as a whole obvious at the time the invention was made to a person having ordinary skill in the art. Moreover, there must be some reason, suggestion or motivation found in the prior art to arrive at the claimed invention, not Applicants' disclosure, which provides the rationale for the specific combination of the claimed invention.

1. Brodtkin and Danforth do not teach applying successive layers of a flowable mass

Brodtkin teaches the formation of dental elements by ink-jet printing a binder into selected areas of sequentially deposited layers of powder (col. 2, lines 40-44). The powder/binder layer forming process is continuously repeated to form the dental

restoration before the restoration is heated to further bind the particles (col. 4, lines 38-46).

Similarly, Danforth teaches the formation of a three-dimensional article by dispensing a mixture of a particulate composition and a binder (col. 2, lines 31-36). The article is formed after each layer of the mixture either solidifies at the environmental temperature or is cooled to adhere to the preceding layer (col. 11, lines 23-25 and lines 40-47).

In contrast to the teachings of both Brodtkin and Danforth, the successively deposited layers of the present invention are bonded without utilizing a binder. This is made possible due to the fact that the nanomeric material is applied in the form of a flowable mass. As explained at page 4, lines 5-10 of the application, the flowable mass of nanomeric material is itself curable, thereby eliminating the requirement for introducing a binder to solidify the dental element. Applicant respectfully submits that the present invention is not obvious over the teachings of Brodtkin and Danforth taken alone or in combination, because Brodtkin and Danforth do not teach or suggest applying successive layers of a flowable mass as recited in claim 1.

In addition, it is submitted that applying layers of a flowable mass would not be obvious based on the teachings of Brodtkin and Danforth, since these references both teach solidifying successive layers using a binder. As such, the only motivation to bond successive layers of a flowable mass is found in the present invention.

Reconsideration and removal of the rejections is therefore proper and requested.

2. Brodtkin teaches UV curing the binder, not the particulate material

The Examiner has taken the position that it would be obvious to provide the material of Danforth in the process of Brodtkin in order to arrive at the present invention (page 3, paragraph 4 of the Office Action). In addition, the Examiner has stated that Brodtkin teaches the presence of UV curing ultraviolet light additives in the polymer matrix. Applicant, however, respectfully submits that such teachings do not disclose the present invention as recited in claim 1.

The ultraviolet light absorbers discussed in the cited section of Brodtkin do not facilitate a curing of the successive layers as assumed by the Examiner. Rather, the

ultraviolet light absorbers function to prevent damage and oxidation of the powder bed due to surrounding ultraviolet light. This point is strengthened by the fact that Brodtkin refers to these compounds as light absorbers, and does not speak of UV curing the successive layers in any other section of the disclosure. Furthermore, those of skill in the art are well aware that ultraviolet light absorbers do not bring about a curing of the successive layers. Instead, it is well known that they capture radiant energy and convert the energy to free radicals in order to prevent embrittlement, ensure color stability and maintain mechanical properties.

Thus, even if one were to add the material of Danforth to the process of Brodtkin, the combination would still fail to teach bonding the successive layers of the dental element by curing with UV light as recited in claim 1. Respectfully, the present invention is patentable over a combination of Brodtkin and Danforth.

3. Danforth does not teach UV curing and is not concerned with forming dental restorations

Danforth teaches the fabrication of three-dimensional articles such as turbine blades, tooling for injection molding, electro-mechanical sensors and actuators, valves and rocket nozzles (col. 4, lines 52-60). In short, these articles can be characterized as tools and equipment.

Applicant submits that an artisan interested in forming a dental element would not look to the teachings of Danforth. Danforth is completely silent with respect to elements used in the dental field, or even elements used in the medical field. Furthermore, the cited powdered material appearing at col. 6, lines 12-16 of Danforth is not described as being a curable material. Thus, one would not expect from a reading of Danforth that this material would be capable of forming successive layers of a dental element that could be bonded using UV light.

Applicant respectfully submits that it would not be obvious to add the material of Danforth to the process of Brodtkin, since Danforth is unrelated to the field of dentistry, and does not teach that his material is curable using UV light.

Reconsideration and removal of the rejections is therefore proper and requested.

E. DEPENDENT CLAIMS

The Examiner has rejected the subject matter of claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Brodtkin in view of Danforth and Bredt (US 5,902,441). In addition, the subject matter of claims 9 and 10 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Brodtkin in view of Danforth and WO 98/51747. Bredt has been cited to teach a 3-D printing technique that makes use of a laser to fuse particles. WO '747 has been cited to teach a first and second post-curing step.

Bredt and WO '747 do not cure the deficiencies of Brodtkin and Danforth as discussed in section D above. Therefore, a combination of each of the cited references fails to teach or suggest the present invention as recited in claim 1.

It is respectfully submitted that all of the claims are patentable over a combination of each of the cited references.

F. FEES

This response is being filed within the shortened period for response. No further fee is believed to be due. If, on the other hand, it is determined that any further fees are due or any overpayment has been made, the Assistant Commissioner is hereby authorized to debit or credit such sum to Deposit Account No. 02-2275. Pursuant to 37 C.F.R. 1.136(a)(3), please treat this and any concurrent or future reply in this application that requires a petition for an extension of time for its timely submission as incorporating a petition for extension of time for the appropriate length of time. The fee associated therewith is to be charged to Deposit Account No. 02-2275.

G. CONCLUSION

In view of the actions taken and arguments presented, it is respectfully submitted that each and every one of the matters raised by the Examiner have been addressed by the

present amendment and that the present application is now in condition for allowance.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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